The Impact of Stuttering; How Can a Mobile App Help?

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ABSTRACT

The mobile application BroiStu was developed due to the need of having a better insight on the impact of stuttering on people who stutter's everyday life. This paper presents a study on this application, verifying which features of impact of stuttering found in scientific literature are included in the application and making a comparison with a similar application. Furthermore, it also summarises a user study conducted with a first panel of experts. New findings and obtained results are discussed.

Categories and Subject Descriptors

K.4.2 [**Computers and Society**]**:** Social Issues—*Assistive technologies for persons with disabilities*

General Terms

Experimentation, Design, Human Factors, Theory

Keywords

Mobile health; stuttering; speech and language therapy; self-care

1. INTRODUCTION

Stuttering is characterized by an abnormally high frequency and/or duration of stoppages in the forward flow of speech. It can be in the form of repetitions of sounds, syllables or one syllable words, prolongations of sounds or "blocks" of airflow or voicing in speech. These behaviours happen on an unconscious level and the person who stutters cannot control them [1]. People who stutter (PWS) do not have "just" problems in their speech. They can often develop negative attitudes related to speech, besides anxiety and depression which can be connected with feelings of insecurity and unpredictability of non-fluent speech [2].

There are many different approaches in stuttering therapy. All of them recognize the importance of understanding the impact that stuttering has on everyday communications and related emotions of PWS. The multidimensionality of this fluency disorder requires proper ways of data gathering during therapy. Due to the need of having a better insight on communication situations (CS), the mobile health (mHealth) application (app) BroiStu (Brothers in Stuttering), initially named iAmS, was developed [3].

2. BROTHERS IN STUTTERING

By using BroiStu, users can register their stuttering related situations (SS) (Fig.1a) to self-monitor their speech as a means of controlling stuttering in a daily basis [3]. Thus, they can see how they are evolving throughout therapy. The app provides reports and charts which help visualizing how SS evolve according to several features (e.g., mood, emotions felt (Fig.1b), relation between the context and the intensity of stuttering). BroiStu is just available in English and Portuguese languages, however it is prepared to easily integrate other languages.
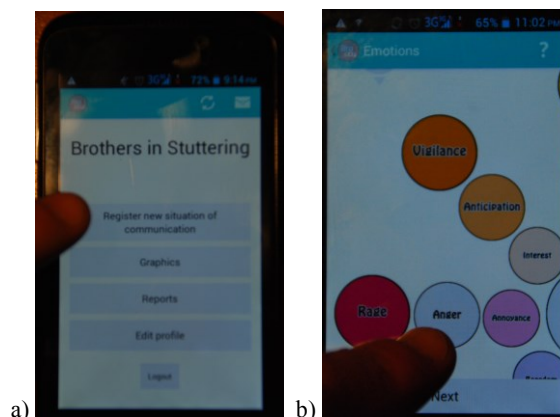

a)   b)

Figure 1. BroiStu screens: a) menu with main functionalities; b) CAAT interface to select emotions felt in a SS [3].

After the release of the first prototype [3], four new modules have been integrated into BroiStu: **Personalisation** - the app automatically adapts itself according to demographic data (age and gender), interactions data (number of registered SS, exchanged messages), and contextual data (mood, emotions felt, etc.); **Exercises** - the user should follow different therapy techniques (e.g., pullout) that are presented; **Voice interaction** - used in the exercises (with speech to text); **Communications** - allows messages exchange between SLP (Speech-Language Pathologist) and PWS, and controls automatic notifications based on to the mood, etc.

3. HOW CAN BROISTU HELP?

3.1 BroiStu's Competitor

There are already some mobile apps [3] that are developed for addressing the stuttering issue. Most of them are more focused on the speech dysfluency and compensatory or avoidance behaviours of stuttering and the techniques for fluent speech and less focused on the impact that stuttering has on a person's everyday communications. The iOs app Fluency Tracker is the closest competitor of BroiStu since it is focused on similar features [3]. Table 1 presents a comparison between BroiStu and Fluency

Tracker, taking into account important features. The only feature not addressed by BroiStu is related to the avoidance behaviours.

Table 1. Comparing BroiStu (B) and Fluency Tracker (FT)

Features	B	FT
Avoidance behaviours	No	Yes
Feelings associated with speaking	Yes	Yes
Frequency of disfluency	Yes	Yes
Graph of changes in speaking behaviour	Yes	Yes
Graph of changes with context included	Yes	No
Module for SLP	Yes	No
Personalisation/adaptation	Yes	No
Repository server	Yes	No

3.2 BroiStu and the Impacts of Stuttering

The impacts of stuttering are in the spotlight of numerous studies [4-9], thus the review presented in Table 2 indicates that BroiStu still have to address a few more in order to improve its content.

Table 2. Impacts of stuttering and their inclusion in BroiStu

Impact of Stuttering	Included
Additional/compensatory movements [4]	No
Physiological reactions [4]	No
Feelings of effort and tension [4]	No
Fear of talking with someone [8]	Yes
Avoidance in communication situations [2]	Yes
Feelings of shame, helplessness and frustrations [8]	No
Feeling stupid and foolish [8]	No
Social anxiety [6]	No
Reduction of verbal input [4]	Yes
Avoiding eye contact [4]	Yes
Using circumlocutions, replacing words [4]	Yes
Acceptance of stuttering [9]	Yes
Feeling of embarrassment [7]	Yes
Avoidance of speaking situations [5]	Yes

3.3 User Study

The user tests were conducted with 7 participants (3 male and 4 female). 5 participants were SLP and 2 were PWS, very accustomed to having therapy. We made sure that each participant understood and got to use all functionalities of BroiStu. We asked them to rate several sentences using a 7-point Likert scale (1- "totally disagree" to 7- "totally agree"). It is noteworthy that: 6 participants considered the process of SS registration as being indeed user-friendly (Mean=5.4; SD=0.9), with the emotions screen generating more doubts with one participant rating it with

3 (Mean=5.1; SD=1.3); all participants thought BroiStu will be useful (Mean=6.3; SD=0.8) and 5 of them really want to use it (Mean=5.1; SD=1.1). A very interesting point is that all participants (3 rated 6; 4 rated 7) considered personalisation as an important feature for the success of BroiStu (Mean=6.6; SD=0.5).

4. HOW CAN BROISTU HELP MORE?

According to Tables 1 and 2, BroiStu still needs to address one feature and some impacts of stuttering. For instance, it is important to add features to deal with avoidance behaviours and the existence of compensatory movements, since they are characteristics of the stuttering pathology and it would be useful to monitor them. It would also be useful that BroiStu would provide a reminder when a PWS did not report new CS at the end of a day. Maybe s/he forgot to do it. Furthermore, it would be useful for users to have access to an "educational screen", which would detail what happens during stuttering. Finally, as many countries do not have mHealth apps which address the impact of stuttering on PWS's daily life, the deployment of the app in other languages, such as Croatian, will improve the usability of the app for users not fluent in English. It is important to have in mind that each language has its own specificities.

5. CONCLUSIONS

BroiStu is a novel m-Health app towards a better stuttering awareness in order to improve speech therapy. The purpose of this app is to extend the therapy to everyday life situations. This paper identifies which impacts of stuttering still need to be addressed. Mentioned disadvantages are guidelines for future work around this app. A thorough user study will be conducted during some weeks to assess the use of BroiStu with PWS in real situations.

6. REFERENCES

[1] Guitar, B. 2006. Introduction to Stuttering. In: *Stuttering – An integrated Approach to Its Nature and Treatment*, Philadelphia PA, R. R. Donnelley, 3-18.

[2] Sardelić, S. 2003. Etiologija mucanja – kratki prikaz. In: *Čimbur, P. Balada o mucanju*. Zagreb: Prosvjeta.

[3] Madeira, R.N., Macedo, P., Pita, P., Bonança, I., and Germano, H. 2013. Building on Mobile towards Better Stuttering Awareness to Improve Speech Therapy. In: *Proc. of MoMM '13*. ACM, 551-554.

[4] Bloodstein O., Ratner, B.N. 2008. Symptomatology. *A handbook on stuttering*. Delmar, Canada, 1-38.

[5] Conture, E.G., Curlee, R.F. 1999. Stuttering and Related Disorders of Fluency. (3rd ed.). New York: Thieme Medical Publisher, Inc.

[6] Craig, A., Blumgart, E., Tran, Y. 2009. The impact of stuttering on the quality of life in adults who stutter. *Journal of Fluency Disorders*, 34, 61-71.

[7] Gregory, H. H. 2003. Stuttering therapy. Rationale and Procedures. Boston: Pearson Education, Inc.

[8] Klompas, M., Ross, E., 2004. Life experiences of people who stutter, and the perceived impact of stuttering on quality of life: personal accounts of South African individuals. *Journal of Fluency Disorders*, 29, 275-305.

[9] Yaruss, J.S., Coleman, C.E., Quesal, R.W. 2012. Stuttering in School-Age Children: A Comprehensive Approach to Treatment. *Language, Speech and Hearing Services in School*, 43, 536-548.